Novel Instrumentation for Lunar Regolith Oxygen Production Facilities, Phase II

Completed Technology Project (2011 - 2016)

Project Introduction

In this SBIR effort, Los Gatos Research (LGR) proposes to develop, test and deploy three novel compact, rugged and easy-to-use multi-gas analysis instruments, based on tunable diode laser absorption spectrometry and a patented cavity-enhanced laser absorption-based strategy called Off-Axis Integrated Cavity Output Spectroscopy (Off-Axis ICOS), for monitoring and control of extraplanetary regolith processing and oxygen production. The instruments will also prove useful for in situ surface analysis. The first instrument (Instrument #1), based on fast extractive sampling, will record measurements of several important gas-phase constituents in regolith processing facilities with extraordinarily high sensitivity, accuracy and specificity in real time. This instrument will integrate directly into NASA's hydrogen and carbothermal reduction test facilities at Mauna Kea, Hawaii. The measurement quantities of interest include the concentrations of HF, HCl, H2S, O2, H2, CH4, CO, CO2, H2O, and H2O isotopes (H2HO or HDO and H218O). The second instrument (Instrument #2) will provide measurements of H2O concentrations and gas temperature directly in the high temperature reactive flow and prior to hydrolysis. The third instrument (Instrument #3) will provide accurate quantification of the aforementioned gases in a compact, low-power form factor suitable for integration into the Regolith and Environment Science and Oxygen and Lunar Volatile Extraction (RESOLVE) project. This analyzer will be used to study both thermal desorption and hydrogen reduction of extraplanetary regolith.

Primary U.S. Work Locations and Key Partners

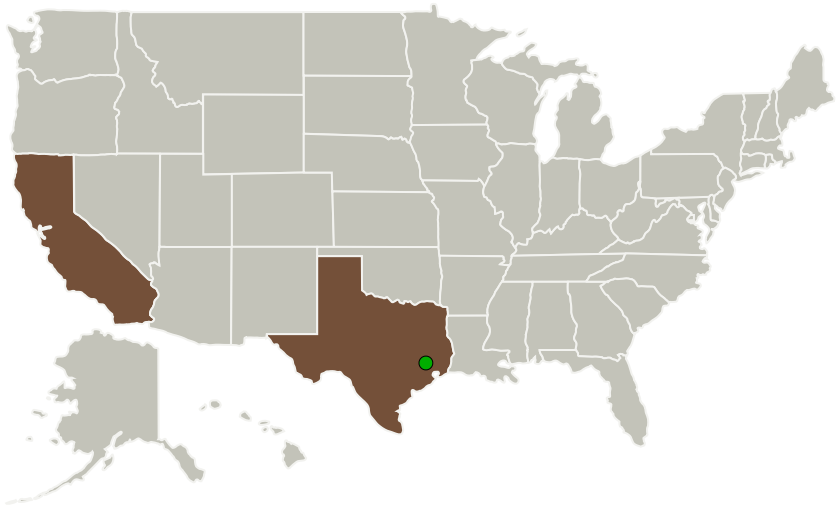

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Table of Contents

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Organizations Performing Work	Role	Type	Location
Los Gatos Research	Lead Organization	Industry	Mountain View, California
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
California	Texas

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Los Gatos Research

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Douglas S Baer

Co-Investigator:

Douglas Baer

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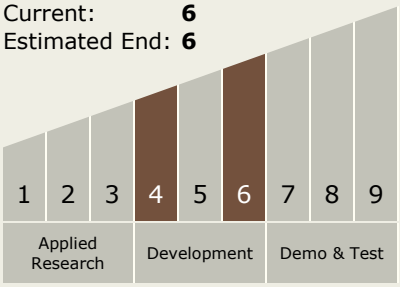
Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.1 In-Situ Resource Utilization
    - TX07.1.1 Destination Reconnaissance and Resource Assessment

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System